

EXHIBIT 1

**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE**

LG.PHILIPS LCD CO., LTD.,)	
)	
Plaintiff,)	
)	
v.)	
)	C. A. No. 04-343-JJF
TATUNG CO.;)	
TATUNG COMPANY OF AMERICA, INC.; and)	
VIEWSONIC CORPORATION,)	
)	
Defendants.)	

**VIEWSONIC CORPORATION'S SURREPLY TO LG.PHILIPS' REPLY BRIEF
IN SUPPORT OF MOTION FOR PRELIMINARY INJUNCTION**

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TABLE OF CONTENTS

	<u>Page</u>
I. Introduction.....	1
II. LPL’s Kaleidoscopic Claim Construction	2
III. LPL’s New Arguments Cannot Change This Simple Truth: The VX900 Is Front Mounted, Not Rear Mounted As Required By The Claims	3
IV. LPL’s New Definition For “Rear Mountable” Makes It Clear That The VX900 Is Not Rear Mounted	6
V. LPL’s New Definition For “Rear Mountable” Also Fails To Overcome The Prior Art Cited By ViewSonic	7
VI. LPL’s New Argument That “First Frame” Is Not Part Of The LCD Module Is Contradicted By the Patents And LPL’s Own Definition of “Frame”	10
VII. Conclusion	13

TABLE OF AUTHORITIES

<u>Cases</u>	<u>Page</u>
<i>C.R. Bard, Inc. v. United States Surgical Corp.</i> , 388 F.3d 858 (Fed. Cir. 2004).....	3, 6, 11
<i>White v. Dunbar</i> , 119 U.S. 47 (1886).....	2

I. Introduction.

In its Opening brief, LPL – and its expert William Bohannon – broadly construed four claim terms to try to show infringement by the VX900. (D.I. 3.) To LPL’s chagrin, however, this claim construction exposed the patents-in-suit to a slew of invalidating prior art. In its Reply brief, LPL and Mr. Bohannon scrambled to construe these claim terms differently and to construe new claim terms hoping to still show infringement while overcoming this prior art. (D.I. 170.)

These new and altered definitions were not submitted with the Opening brief, and therefore, LPL’s Reply should be disregarded in its entirety. LPL has offered the Court no explanation why it could not submit what it now contends are the actual definitions of key claim terms in its moving papers. Even if the Court entertains LPL’s last-ditch efforts to add new evidence and change its claim construction to suit its arguments, LPL has still failed to meet its burden of proof.

Because ViewSonic is not allowed to conduct discovery on this improper new material, and in order to not overwhelm the Court with an extensive briefing on all of the new arguments and evidence raised in the Reply, ViewSonic will limit this Surreply to three points raised by the new material that illustrate LPL’s failure to meet its burden of proof, namely:

(1) LPL argues for the first time a definition for “front mounted” that is completely contradicted by the patents, the prior art, the file history, and the prior testimony of LPL’s expert. LPL’s attempt to blatantly ignore this evidence does not change the simple fact that the VX900 is front mounted, not rear mounted as required by the claims of the patents-in-suit;

(2) LPL argues for the first time that the “rear-mountable” claim limitation requires (a) the “housing” be the rear housing; and (b) the rear housing must provide substantial support for the flat panel display device when fastened together in accordance with the patents. This 11th-hour attempt to avoid the prior art is again in conflict with the prior testimony of LPL’s expert and, even if accepted, still does not lead to a finding of infringement by the VX900; and

(3) LPL advances a new definition and argument for the term “first frame” which ignores the express teachings of the patents and improperly eliminates the requirement that the first frame be an element of the backlight unit. This improper construction cannot sweep away the unassailable evidence of non-infringement by the VX900, nor the impact of the prior art on the claims as written.

The record supports but one conclusion, namely, that the instant motion for preliminary injunction should be denied due to the failure of LPL to establish a strong likelihood of success on the merits, the existence of substantial questions of validity of the patents which still remains, and the fact that the balance of hardships continues to tip in favor of denial of the instant motion.

II. LPL’s Kaleidoscopic Claim Construction.

It is a canon of claim construction that claims are not to be treated “like a nose of wax, which may be turned and twisted in any direction” to support a party’s arguments. *White v. Dunbar*, 119 U.S. 47, 51, 7 S.Ct. 72, 30 L.Ed. 303 (1886). Finding that its original definitions exposed the clear invalidity of the patents-in-suit, LPL has now turned and twisted its definitions into something completely new – violating this canon. In changing its definitions, LPL relies solely on a dictionary – extrinsic evidence – and

completely disregards the patents and file history – intrinsic evidence – in violation of another canon of claim construction. *C.R. Bard, Inc. v. United States Surgical Corp.*, 388 F.3d 858, 861-62 (Fed. Cir. 2004). “A long line of cases indicates that the intrinsic record is the primary source for determining claim meaning. The intrinsic record includes the specification and prosecution history.” *Id.*

Because LPL’s new and altered definitions violate the long established rules of claim construction, and because their improper submission in violation of Local Rule 7.1.3(c)(2) prejudices ViewSonic’s ability to defend against the motion, the Court should not even consider them.¹ Even if the Court does, however, these definitions do not overcome ViewSonic’s invalidity challenge and continue to negate a finding of infringement.

III. LPL’s New Arguments Cannot Change This Simple Truth: The VX900 Is Front Mounted, Not Rear Mounted As Required By The Claims.

LPL admits that “front mounting is outside the scope of the asserted claims.” (D.I. 170, p.2 n. 2.) Thus, for LPL to succeed on the merits, it is imperative that the VX900 not be front mounted. The patents-in-suit offer the following definition of front mounting:

For mounting the LCD device **130** to the display case **122**,
the LCD device **130** is placed on the rear case **123** and the
holes of the supporting frame **136** and the ribs **123a** are
fastened together preferably by screws **138**. The front case
121 is coupled to the rear case **123**. Hereinafter, the way in

¹ By way of illustration, the table attached hereto as Exhibit A sets forth LPL’s various attempts to sculpt and then re-sculpt claim term definitions.

which the LCD device is mounted to the case from the front toward the rear direction is defined as the front mounting method, and the assembled structure of the LCD device and the case formed through the front mounting method is defined as the front mounting structure. In the front mounting structure of the LCD device, since the protrusions **136a** require additional space corresponding to the protruded width d , the display area of the LCD device is reduced in comparison to the fixed size of the display case **122**. The front mounting structure may also include an additional feature to further support the LCD device panel, as shown in Figs. 3A and 3B. (D.I. 1; '641 Pat., Col. 1:49-67, emphasis added.)

Pursuant to this definition, front-mounting does not require that the screws enter the front external case. The prior art figures shown in the patents-in-suit (and reproduced as Exhibits B to this Surreply) further illustrate this point. As shown in the figures, the mounting screws do not enter the front external case; rather, they pass through the front frame of the LCD module and are received into ribs on the interior of the rear external case. Indeed, even LPL's expert identified as "front mounted" a prior art structure whose screws pass through the front frame of the LCD module and not through the front exterior case. (D.I. 67 – Exh. F; *see also* copy of structure attached hereto as Exhibit C.)

This is precisely how the VX900 LCD module is mounted in the rear exterior case. The VX900 has six screws that pass through the front of the LCD module and/or

the tray element which are received into threaded holes on or connected to the rear external case to mount the structure to the case.² According to the patents-in-suit, the prior art, and Mr. Bohannon's earlier testimony, this means the flat panel display device in the VX900 is front mounted.

Despite this incontrovertible evidence, LPL nevertheless asserts that the VX900 is not front mounted because the mounting screws do not enter the front external case. This argument is without merit. LPL's argument that the six front-mounting screws in the VX900 "merely hold the LCD module together; they do not mount the LCD module or the flat panel display device in the VX900 monitor to anything" is also just plain wrong. (D.I. 170, p.2.) It is inconceivable that LPL could make this argument knowing that in order to detach the rear housing of the VX900 to take the pictures attached to his first declaration, Mr. Bohannon (and presumably LPL's counsel) would have had to first remove these six screws. (D.I. 7-Exh. 6; Viewsonic 003.jpg)³

It is simply irrefutable that the VX900 is front mounted, not rear mounted, and therefore does not infringe the patents-in-suit. Thus, even this re-sculpted definition cannot overcome the inevitable conclusion; LPL's motion should be denied.

² In its Answering brief (D.I. 64), ViewSonic included an exploded drawing of the assemblage of the VX900 which shows screws entering the LCD module from the front and being received into ribs or bosses on the interior of the rear case. (*see also* D.I. 67 – Exhs. A & C.)

³ This picture shows the back of the internal tray "C". Four screws fasten the four tabs extending from the bottom of that tray to the threaded elements on the interior of the rear housing as shown in D.I. 67-Exh. C. In addition, two screws connect the holes in the top left and right corners of the tray to the threaded inserts in the interior of the rear housing. *See id.*

IV. LPL's New Definition For "Rear Mountable" Makes It Clear That The VX900 Is Not Rear Mounted.

According to LPL's new definition for "rear mountable," the housing or case must provide "substantial support for the flat panel display device" when it is mounted using the fastening part at the rear surface of a first frame associated with the flat panel display device. (D.I. 170, p.3; D.I. 171.)⁴ Remarkably, LPL attempts to distinguish the PixelVision prior art on the basis that a screw (D5) which passes through the rear housing and into a fastening element on the rear surface of what LPL submits is the flat panel display device does not invalidate the patent claims because that screw, according to LPL, does not connect the rear case to the flat panel display device in a way which permits the rear case to provide substantial support for the flat panel display device. (D.I. 171, ¶ 118.) As such, according to this newly minted definition of "rear-mountable," in order for a device to be "rear mounted" in accordance with the patents, the rear case must provide substantial support for the flat panel display device and that support must be accomplished through a fastening part which passes through the rear case into the device.

As discussed above, it is the six front mounted screws in the VX900 which connect the flat panel display device to the rear case in a way that permits the rear case to support the device. Ignoring this reality, LPL uses its new definitions to falsely assert that the two monitor stand screws identified as "B" "serve as *the only fastening elements* or parts that mount the flat panel display device in the monitor." (D.I. 170, p. 6.) Again, this argument is simply wrong.

⁴ ViewSonic's assertion that "rear-mountable" must also require that the viewing area of the LCD module is maximized relative to the available area is supported by the summary of the invention and elsewhere in the patents. *Bard*, 388 F.3d at 864 (statements in Summary of the Invention, which describe the invention as a whole, are particularly "likely to support a limiting definition of a claim term.")

Instead, the undisputed evidence submitted by ViewSonic in its Answering brief, establishes that the two screws LPL identifies as “B” are not provided for attaching the LCD device to the VX900 housing; rather, they are for attaching the stand to the monitor. (D.I. 69, 72.) Thus, these two screws, when attached, do not enable the rear housing to provide “substantial support for the flat panel display device” as required by LPL’s definition of rear-mountable. Therefore, even under this new definition of rear mountable, the VX900 cannot infringe the patents-in-suit.

V. LPL’s New Definition Of “Rear Mountable” Also Fails To Overcome The Prior Art Cited By ViewSonic.

LPL’s new definition for “rear mountable” does not save the patents-in-suit from ViewSonic’s prior art challenge. LPL’s expert, Mr. Bohannon, submitted a new 143-paragraph declaration with the Reply brief that uses LPL’s new and altered definitions to try and distinguish the prior art.⁵ (D.I. 171.) Mr. Bohannon dismisses several of the prior art references as not “rear-mounted” because their mounting screws enter the front external housing as opposed to the rear external housing. Yet, nowhere in the definition he provides this Court for “rear mountable” does he say that the “housing” can *only* be the rear housing. (D.I. 171, ¶ 11.) Apparently, LPL hoped the Court would overlook this inconsistency. And this is not the only example of the capriciousness in Mr. Bohannon’s opinions.

To overcome several of the prior art references, Mr. Bohannon opines that a threaded hole is a fastening part, but a through-hole or “bare hole” cannot be a fastening

⁵ ViewSonic was not allowed to examine Mr. Bohannon regarding prior art structures or his opinions on the validity of the patents-in-suit because LPL’s counsel instructed him not to answer those questions and the Court denied ViewSonic’s motion to compel him to answer. (D.I. 44, 53-55, 58, 92.)

part. (D.I. 171, ¶ 12.) This plainly contradicts Mr. Bohannon's previous testimony that such holes can be fastening parts:

Q: What kinds of things can be fastening parts in the context of claim 35?

A: The screw hole for just one example.

Q: Can you give me another example?

A: The hole without threads. (*See* Exhibit D attached hereto; Bohannon Depo. p. 99:21-25.)

Q: If it's a through-hole, does it have to include something else to be a fastening part?

A: I don't think so. (Exh. D, Bohannon Depo p. 132:1-3.)

Moreover, the patents-in-suit clearly state they can be fastening parts: "a through-hole 21a (which may be referred to as a fastening hole or a similar conveniently descriptive term, and which together with the material defining the hole may be referred to as a fastening element or fastening part) is formed." (D.I. 1; '641 Pat., Col. 4:50-55; *see also* Col. 4:60-64; Col. 5:17-21, 52-57; Col. 7:25-30.)

When flip-flopping on his claim construction does not provide the result Mr. Bohannon needs, he simply concludes – without citing any basis for his opinion – that references which possess each of the limitations in the claims are still not rear-mountable because the housing does not provide substantial support for the flat panel display device. His analysis of the Hashimoto patent (US Pat. No. 5,119,214) provides one such example. (A courtesy copy of the Hashimoto patent is resubmitted as Exhibit E hereto).

Hashimoto generally discloses the structure of a liquid crystal television set. The invention includes a “top” or front external case, a center internal case, and a “bottom” or rear external case. It also includes an LCD panel and a backlight. These parts are assembled together in four steps: (i) the LCD panel is attached to the front external case, (ii) the center internal case is attached to the front external case by a single screw, (iii) the backlight is secured to the rear of the internal center case; and (iv) the assembly unit of the front case and center case are “fixedly secured” to the rear case by a single screw. (D.I. 66 - Exh. I, Col. 4:51-5:27.)

Mr. Bohannon acknowledges that Hashimoto teaches a screw passing through the rear case and entering into an internal center structure containing the backlight unit. Nevertheless, he concludes this patent does not teach rear mounting. He summarily states that “the flat panel display device is not mounted to the bottom case 4 or ‘housing’ at all.” (D.I. 171, ¶ 98.) Instead, he concludes the device is front mounted because of the single screw that attaches the center case to the front external case. But this application of the claim terms to Hashimoto is directly at odds with Mr. Bohannon’s application of the same claim terms to the VX900.

Another example of the handiwork of sculptor Bohannon can be seen in his analysis of the PixelVision SGT15P. As discussed above, the PixelVision has four corner through holes (D1-D4), as well as a center threaded hole (D5) located at the rear surface of the interior metal tray that mount the rear housing to what LPL identifies as the LCD display device. Mr. Bohannon says the threaded center hole D5 does not anticipate the claims because he concludes – without citation to any evidence – that center hole D5 is simply used to prevent warping of the housing around the tilt/swivel mount. (D.I. 171,

¶¶ 118, 127.) He contends that when fastened to hole D5, the PixelVision housing does not provide “substantial support for the flat panel display device.” Yet he offers no basis for this opinion, nor does he explain the obvious disparity between this analysis and his conclusion of infringement by the VX900 stand-mounting screws.

These are but a few examples of the malleable nature of Mr. Bohannon’s opinions, which like the long proscribed “nose of wax” approach employed by LPL, have no place in proper claim construction. As a result, his testimony should be accorded no weight. Moreover, this testimony only highlights the substantial questions of validity of the patents-in-suit established by ViewSonic, which questions independently demand the denial of LPL’s motion for the extraordinary remedy of a preliminary injunction.

VI. LPL’s New Argument That “First Frame” Is Not Part Of The LCD Module Is Contradicted By The Patents And LPL’s Own Definition Of “Frame.”

LPL states that “the claim defines the ‘first frame’ as the first frame of a ‘flat panel display device,’ where the plain and ordinary meaning of the term ‘flat panel display device’ is obviously broader than LCD module.” (D.I. 170, p. 4) This definition is facially flawed as it completely ignores the plain language of four of the asserted claims each of which expressly define the first frame as a part of the backlight unit, to wit: “backlight unit including a first frame,” “the first frame of the backlight unit,” and “a backlight unit having a first frame.” (D.I. 1, ‘641 Pat., Claims 35, 36; ‘718 Pat., Claims 33, 34.) Even LPL’s expert previously testified that “first frame” in these claims means that the backlight unit has as one of its components a first frame. (Exh. D, Bohannon Depo, p. 99:1-8.) Thus, this proposed definition should be rejected.

Moreover, even if the Court accepts LPL’s re-sculpted definition for “first frame,” the patents-in-suit clearly instruct that a “flat panel display device” or LCD display

device is, in fact, what the industry refers to as an LCD module. While LPL tries to use its “definitions” to stretch the patents to apply to the VX900, the teachings of the patents could not be more clear:

“The LCD device has an LCD panel, a backlight device fixed to the back of the LCD panel, and a supporting frame for assembling the LCD panel and the backlight device along the edge.”

(D.I. 1, ‘641 Pat., Col. 1:42-45, numeric citations omitted.) In fact, the only structure identified in the specification as the “first frame” is item 14g in Figure 4C, which is the rear frame of the LCD module/device. (D.I. 1, *see e.g.* ‘641 Pat., Col. 4:13-26; a copy of Figure 4C is attached hereto as Exhibit F.) Moreover, LPL repeatedly referred to the first frame during prosecution of the patents in suit as element 14g in Fig. 4c in order to obtain allowance of the claims as issue. (D.I. 67 – Exh. G, pp. 47-48.) *See Bard*, 388 F.3d at 864, n.3 (“a reading of the specification as a whole” can make it clear that “the claimed invention is narrower than the claim language might imply” and this also applies to the prosecution history.) Neither LPL nor Mr. Bohannon have pointed to anything in the patents-in-suit that contradicts this definition of a flat panel display device or “first frame.”

Thus, in the context of the patent teachings, one of ordinary skill in the art could only understand “first frame” to mean the first frame of the LCD module/device or its equivalent. As the internal tray is not a part of the backlight unit, and given that the LCD device in the VX900 contains the very frame identified in the patents as the first frame (element 14g of Fig. 4c), and given that the VX900 does not use frame “C” to secure the

LCD device to the case, it is axiomatic that the VX900 cannot practice the invention of the patents.

To try to overcome this problem, LPL argues that the “first frame” is any structure which qualifies as a “frame” and which has a fastening element on its rear surface. Even LPL’s altered definition for “frame,” however, exposes the fallacy of this proposition and indeed supports ViewSonic’s position that the first frame is not just any frame in the monitor, but rather is the rear frame of the LCD device.

According to LPL’s reply definition, “a ‘frame’ is an interior structure made for admitting, enclosing, or supporting *the flat display panel*.” (D.I. 171, emphasis added.) It is uncontroverted that a “flat display panel” is a specific device – namely, the element of an LCD display device identified in the patents as element 12 in Fig. 4c (and elsewhere), while LCD display device is identified in the patents as element 10, (a combination of the flat display panel, the backlight unit, and the first and second frames). (See Exh. F attached hereto.) The patents teach that the interior structure which encloses the flat display panel is the frame which assembles the panel and the backlight device along the edge, referred to as element 14g in Fig. 4c. (D.I. 1, ‘641 Pat., Col. 1:42-45; see also Exh. F.) There can be no question that in the VX900, frame “J” – and not tray “C” that LPL relies on – is the frame that assembles the LCD panel and the backlight device along the edge. (D.I. 69, 72, 67.) Thus, even applying LPL’s unsupported construction of “first frame” in conjunction with the corresponding new definition of “frame,” the VX900 still does not infringe the patents-in-suit. Therefore, the instant motion should be denied.

VII. Conclusion.


LPL's improperly submitted new material highlights LPL's failure – indeed, inability – to meet its burden of proof to establish a prima facie case of infringement or to show that ViewSonic's attack on the patents' validity lacks substantial merit. Therefore, LPL's motion for preliminary injunction should be denied.

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EXHIBIT A

ATTACHMENT A
TABLE OF LPL'S CHANGING
CLAIM TERM DEFINITIONS

Claim Term	As Defined in Opening brief	As Defined By Bohannon in Deposition	As Defined Now in Reply Brief
front mount	<p>Not defined, but patents state:</p> <p>For mounting the LCD device 130 to the display case 122, the LCD device 130 is placed on the rear case 123 and the holes of the supporting frame 136 and the ribs 123a are fastened together preferably by screws 138 (referring to Fig. 2).</p>	<p>"Screws are going through the front in the corners into a back where the screws are going from the front into the back." (Exhibit D to Surreply, p. 79:10-15; and Exhibit C.)</p>	<p>States front mounting requires screws pass through the front external case. (DI 170, p.2)</p>
rear mountable	<p>Not defined by LPL or in the patents.</p>	<p>"The definition of rear mounting is where the -- the LCD devices, which consists of a variety of arrangement and frames and the support frame and the various elements shown in -- in the patents -- the first -- the -- you know, where you count frames, but you have frames surrounding a module and a backlight unit, and then you have a case, and the -- the screws go through the rear of the case into a frame on the backlight of the LCD module." (Exhibit D to Surreply, pp. 80:23-81:7.)</p> <p>Also, when asked, "Is there an ordinary and customary definition of 'rear mounting' in the LCD industry?" he</p>	<p>"the ability to securely fix, to firmly attach, or to make fast a flat panel display device to a housing or case, using a fastening element at the rear surface of a first frame associated with the flat panel display device, where the housing or case provides substantial support for the flat panel display device"</p> <p>Also, throughout his Fourth Declaration, when seeking to distinguish the prior art, Mr. Bohannon concludes that the "housing" must be the rear external housing and states it cannot be the front housing. (DI 171.)</p>

ATTACHMENT A
TABLE OF LPL'S CHANGING
CLAIM TERM DEFINITIONS

		testified: "Not to my knowledge." (Exhibit D to Surreply, pp. 82:17-19.)	
frame	a case or structure made for admitting, enclosing, or supporting something		<i>an interior structure</i> made for admitting, enclosing or supporting <i>the flat display panel</i> (DI 171.)
first frame	Not defined	"Well, the "first frame" is the, you know, this part at the last -- I'm pointing to 14g here [in Figure 4c] that has a fastening component . . . fastening part at the rear surface of this frame." (Exhibit D to Surreply, p. 98:12-20.)	States it is <i>not</i> the first frame of an LCD module [(i.e., element 14g in Fig 4c)]. Instead says it is: "the first frame of a flat panel display device . . . which is obviously broader than LCD module." (DI 170, p.4)
fastening part/fastening element	Not Defined	"a variety of things" including: "The hole without threads." (Exhibit D to Surreply, p. 99:12-25.) When asked "If it's a through-hole, does it have to include something else to be a fastening part?" he testified: "I don't think so." (Exhibit D to Surreply, p. 132:1-3.)	"an element or part, or combination of elements or parts, that securely fix, firmly attach, or make fast one component with respect to another component." (DI 171.) Also, says it excludes a bare hole or through-hole. (DI 170.)
LCD display device/flat panel display device	Not Defined		Still not defined, but argues it is more than just the LCD module
housing	a case or enclosure		<i>"an exterior case or enclosure with respect to the flat panel display device"</i>

ATTACHMENT A
TABLE OF LPL'S CHANGING
CLAIM TERM DEFINITIONS

			In addition, throughout his Fourth Declaration when seeking to distinguish the prior art, Mr. Bohannon concludes that the "housing" must be the <i>rear</i> external housing and argues that it cannot be the <i>front</i> housing. (DI 171.).
case	an outer covering or housing		changed by the modified definition of "housing".

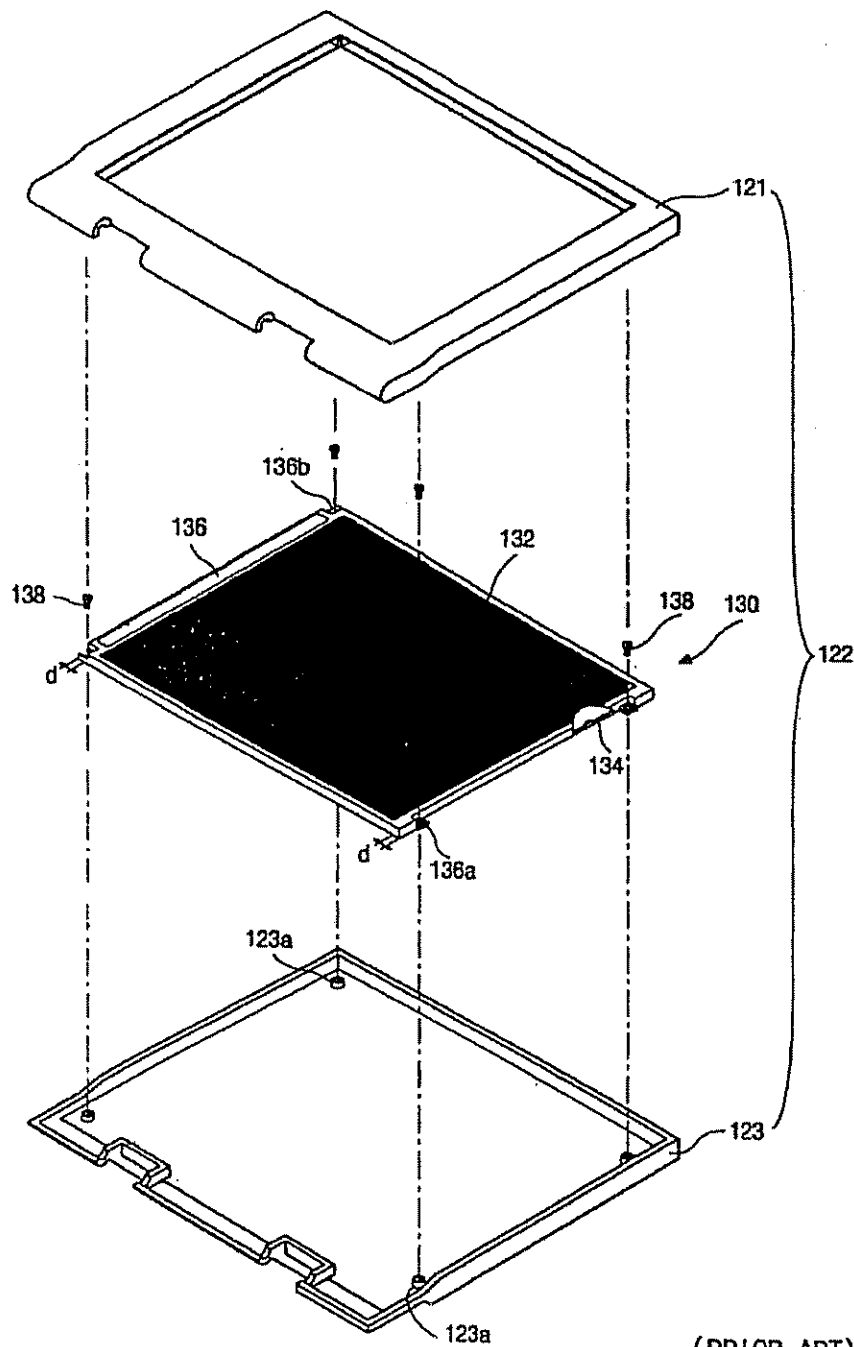
EXHIBIT B

U.S. Patent

Dec. 31, 2002

Sheet 2 of 16

US 6,501,641 B1



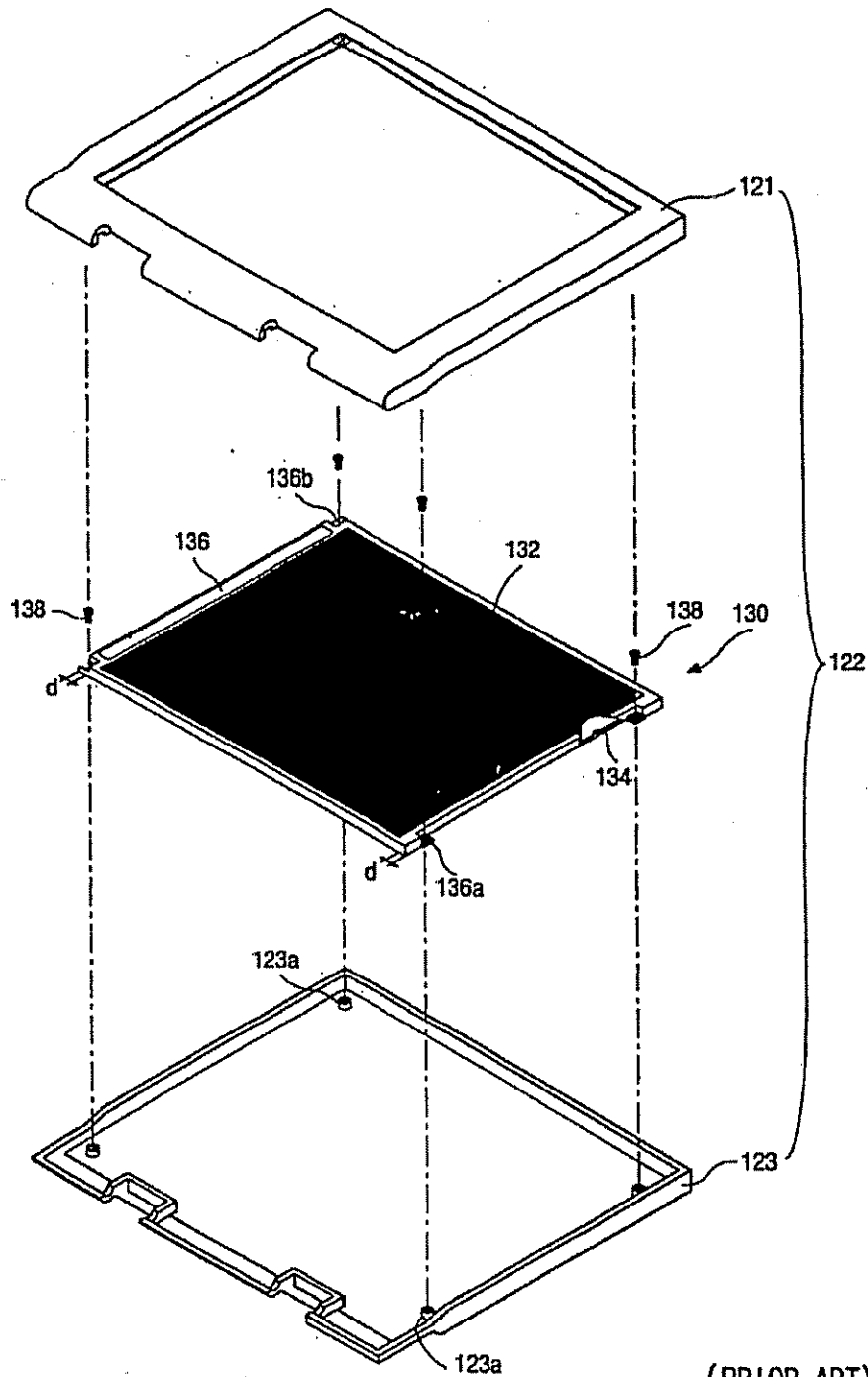
(PRIOR ART)
FIG. 2

U.S. Patent

Dec. 24, 2002

Sheet 2 of 16

US 6,498,718 B1



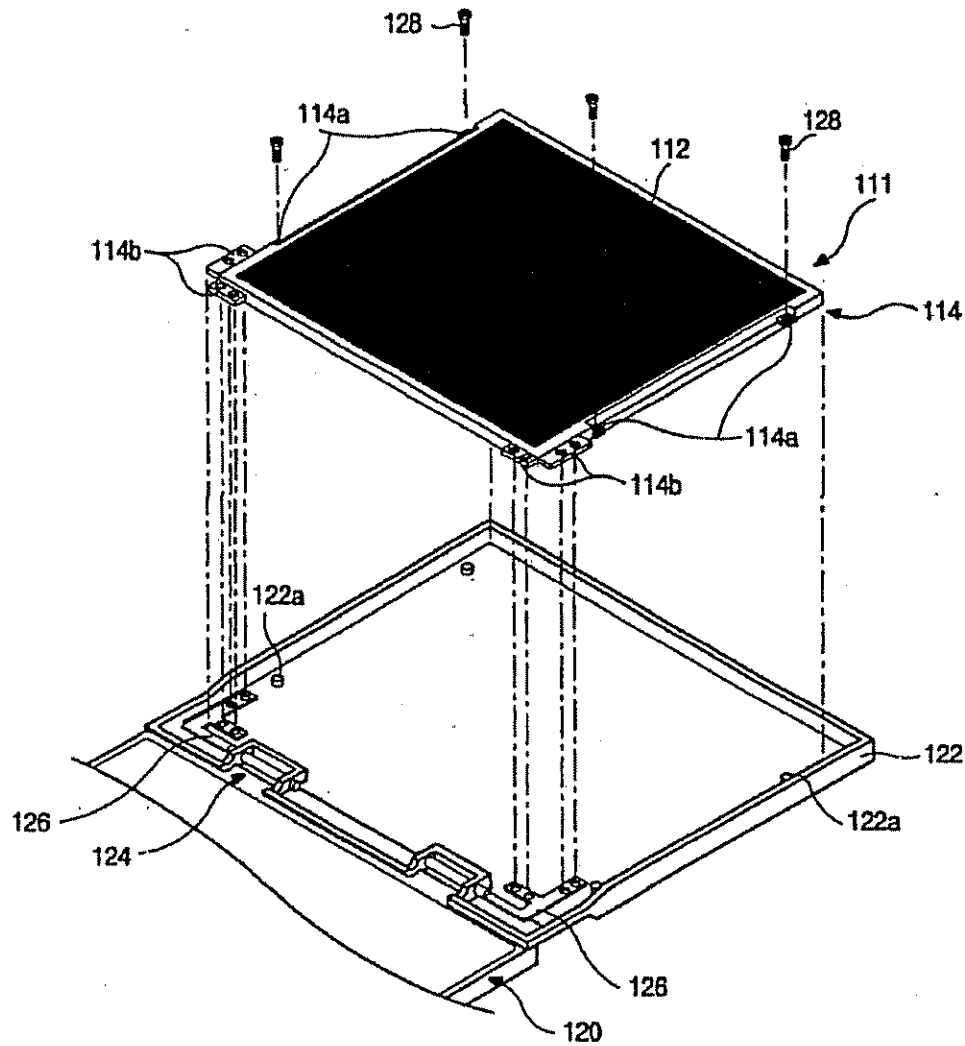
(PRIOR ART)
FIG. 2

U.S. Patent

Dec. 24, 2002

Sheet 3 of 16

US 6,498,718 B1



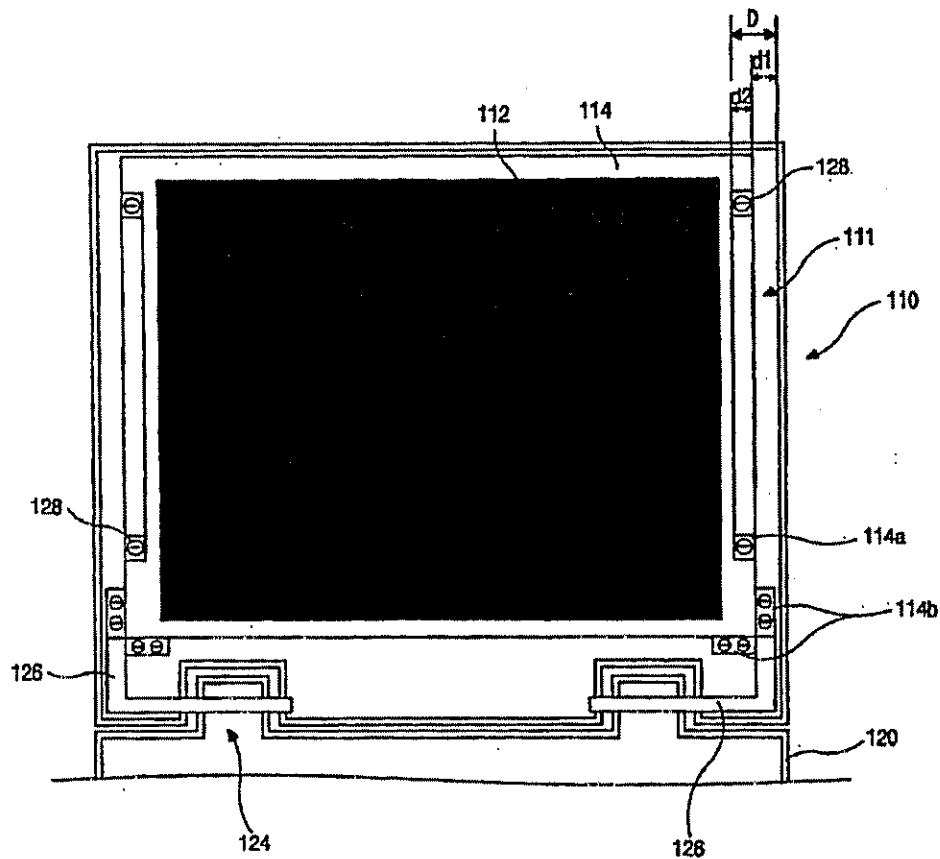
(PRIOR ART)
FIG. 3A

U.S. Patent

Dec. 24, 2002

Sheet 4 of 16

US 6,498,718 B1



(PRIOR ART)

FIG. 3B

EXHIBIT C

⑨ 日本国特許庁(JP)

⑩ 特許出願公開

⑫ 公開特許公報(A) 平4-134900

⑬ Int.Cl.⁵

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⑯ 特 願 平2-255388

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 ⑳ 代 理 人 弁理士 佐々木 宗治 外2名

6
 Deft(s) _____ Plf(s) _____ EXHIBIT for I.D.
 LINDA A. BANKEY, CSR # 7993
 Date: 8-6-04
 Witness: B. HANNON
 (6.4)

明 細 書

1. 発明の名称

表示装置

2. 特許請求の範囲

表示窓を設け表面に導電膜を形成したケースと、
 該ケースの前記表示窓を塞ぐ透明板と、該透明板
 と前記ケースに包囲されて収容された電子回路を
 内蔵する表示装置において、

前記透明板に透明導電層を成層して該透明導電
 層と前記ケースの導電膜により前記電子回路の全
 周廻を電気的にシールドしたことを特徴とする表
 示装置。

3. 発明の詳細な説明

[産業上の利用分野]

一般に、電子機器の制御部やディスプレイに内
 蔵された電子回路に、電流や電圧の周期的な変化
 があると電磁界輻射ノイズが空間に放射される。
 空間に放射された電磁界輻射ノイズは、家庭のテ
 レビやラジオ受信機等に悪影響を与える。

本発明は表示装置に係り、更に詳しくは電磁界

輻射ノイズの発生を防止した表示装置に関するも
 のである。

[従来の技術]

第5図は、従来の表示装置の構成を示す断面説
 明図である。

第5図において、(4)は表示装置である。(11)
 は表示装置(4)における前面カバー、(12)は背面
 カバーである。(15)は前面カバー(11)の表示窓、
 (16)は表示窓(15)の内側に設けられた透明板であ
 る。(19)はフラット形のディスプレイ、(20)は固
 定ネジである。また、(22)はディスプレイ(19)の
 取付孔、(23)は背面カバー(12)に設けられた受座
 である。前面カバー(11)と背面カバー(12)により
 箱形のケース(10)が構成され、ケース(10)の内部
 にディスプレイ(19)が収容されている。そして、
 ケース(10)の内面全体には、メッキ処理により導
 電膜が形成されている。

このような構成の従来の表示装置(4)において、
 操作中にディスプレイ(19)に内蔵された電子回路
 の電流や電圧の断続的な変化に伴ってノイズが発

特開 4-134900 (2)

生ずる。発生したノイズでディスプレイ(19)の背面と側面方向に投射されたノイズは、ケース(10)の内面の導電膜により接地される。しかしながら、ディスプレイ(19)の上方に向かって投射されたノイズは、表示窓(15)内の透明板(16)をそのまま通過して大気中に放射される。放射されたノイズは所謂電磁界放射ノイズとなり、家庭のテレビやラジオ受信機等に悪影響を与えることになる。

[発明が解決しようとする課題]

従来の表示装置は、上述したように透明板を介して大気中に電磁界放射ノイズが放射される。このため、ラジオ受信機等の他の電子機器類に、雑音を与えてトラブルを起こすことがある等の問題点があった。

本発明は、このような従来の表示装置の問題点を解決するために成されたもので、電磁界放射ノイズの発生を防止した表示装置を実現するようにしたものである。

[課題を解決するための手段]

この発明は、表示窓を設け表面に導電膜を形成

したケースと、このケースの表示窓を覆く透明板と、透明板とケースに包囲されて収容された電子回路を内蔵する表示装置において、透明板に透明導電層を成膜して、この透明導電層とケースの導電膜によって電子回路の全周囲を電気的にシールドした表示装置を構成したものである。

[作 用]

前面カバーと背面カバーで構成された箱形の表示装置のケースの内面は、メッキ処理によって導電膜が形成されている。また、表示窓を覆く透明板の内側には、透明な導電性の物質の被膜が成膜されている。したがって、ケース内のディスプレイは、表示窓を含めて周囲全体が電波を遮断する導電性物質のシールドで覆われることになる。この結果、ディスプレイ内部の電子回路の電気的な変化で発生されたノイズは、導電膜と透明導電層によって完全にシールドされて電磁界放射ノイズの空中への放射が防止される。

[発明の実施例]

第1図は本発明実施例の構成説明図、第2図は

表示装置の断面説明図、第3図は透明板の拡大断面図、第4図は表示装置の分解斜視図で、ここでは本発明をワードプロセッサのような機器に適用した場合が例示されている。本発明実施例の図面において第5図に対応する部分に同一符号が付されて一部重複するが、やや詳しく説明する。

第1図において、(1)はワード・プロセッサのような電子機器、(2)は電子機器(1)の本体を構成する制御部である。制御部(2)の内部には、情報を処理するCPUやメモリを含む主回路及び、この主回路を動作させる直流電源、或いは情報を記憶する補助記憶装置等が収容されている。(3)はキーボード、(4)は表示装置である。キーボード(3)には数字や文字を表示した多数のキーが設けられ、表示装置(4)の表示を見ながら制御部(2)に情報が入力される。

表示装置(4)の構成を示す説明図が、第2図乃至第4図に示されている。

第2～4図において、(10)は表示装置のケースである。ケース(10)は、前面カバー(11)と背面カ

バー(12)とからなる。(13)は前面カバー(11)の裏側に設けられたツメ、(14)はツメ(13)に対応して背面カバー(12)に形成されたツメで、両方のツメ(13)と(14)とを係合させて前面カバー(11)と背面カバー(12)が組み合わされる。そして、両カバー(11)と(12)で構成したケース(10)は樹脂成型して作られ、前述の従来装置と同様にツメ(13)と(14)とを含めて内面に導電膜が形成されている。

(15)は前面カバー(11)の枠内で形成された表示窓、(16)は表示窓(15)を塞ぎガラス又はアクリル樹脂等からなる透明板である。表示窓(15)は、前面カバー(11)における表示領域を区画する。また、透明板(16)は表示面に加わる外圧や塵埃に対して、表示装置の内部素子を保護する機能を果たす。透明板(16)の表面には外部光の反射に伴う表示が不鮮明になることを防ぐために、凹凸等の反射防止の処理加工が施されている。特に、本発明実施例では第3図に示されているように、透明板(16)の裏面に一様な厚さで導電性の透明な導電層(17)が作られている。透明導電層(17)には例えば、酸化

特開平4-134900 (3)

インジウムが透明材として用いられ、透明板(16)に蒸着で成層されて表示窓(15)の表示に支障がないようになっている。(18)はバネ材からなる接触片で、導電性の接着剤によって透明板(16)の透明導電層(17)側の面に接着されている。接触片(18)は図示のようにほぼ針状に折り曲げられ、自由端が前面カバー(11)の導電膜と接触してこの導電膜に対して透明導電層(17)を電気的に接続するようになっている。

(19)はディスプレイ、(20)はディスプレイ(19)を背面カバー(12)に固定するための複数の固定ネジである。ディスプレイ(19)にはフラットパネルディスプレイが用いられ、プラズマディスプレイや液晶ディスプレイで代表される。(21)はディスプレイ(19)の有効表示領域、(22)は取付孔、(23)は背面カバー(12)に設けられネジ穴の回りに形成された受座である。

このような構成の本発明の表示装置(4)は第4図の分解図に示されるように、ディスプレイ(19)が受座(23)に載せられてから4本の固定ネジ(20)

によって背面カバー(12)の内面に取付けられる。一方、透明板(16)は透明導電層(17)を内側にして、例えば接着剤によって表示窓(15)の窓を覆うように前面カバー(11)の内面に固定される。また、接触片(18)は前述のように自由端を前面カバー(11)の導電膜に接触させて、透明板(16)の透明導電層(17)側の面に接着されている。その後、ソメ(13)及び(14)とを噛み合わせて、前面カバー(11)を背面カバー(12)に重ね合わせて一体に結合する。このとき、透明板(16)に固着され平常状態で第3図のような形の接触片(18)が第2図のように圧縮されて変形し、ディスプレイ(19)のフレームと前面カバー(11)の導電膜に弾性的に圧着する。この結果、ディスプレイ(19)の全周囲が透明板(16)とケース(10)によって物理的に包囲されると共に、ケース(10)の内面の導電膜と透明板(16)の透明導電層(17)によって電気的にシールドされる。したがって、ディスプレイ(19)に内蔵の電子回路にノイズが発生しても、回り中の透明導電層(17)等にシールドされて電磁界輻射ノイズの空中への放射が

防止されることになる。

なお、上述の実施例では透明板(16)の透明導電層(17)と前面カバー(11)の導電膜とを接触片(18)により電気的に接続させた場合で説明したが、接触片(18)を導電性の接着剤等に代えてもよく、透明導電層(17)を接地する何等かの接地手段を設ければ接触片(18)を省略することができる。また、本発明をフラットパネルディスプレイに適用した場合で説明したが、CRT等の表示装置に適用することも可能である。

〔発明の効果〕

本発明によれば、表示窓を設け表面に導電膜を形成したケースと、このケースの表示窓を覆う透明板と、透明板とケースに包囲されて収容された電子回路を内蔵する表示装置において、透明板に透明導電層を成層して、この透明導電層とケースの導電膜によって電子回路の全周囲を電気的にシールドした表示装置を構成した。

この結果、従来の表示装置のように、表示窓から電磁界輻射ノイズが空間に放射されるようなこ

とがない。したがって、家庭のラジオ受信機に電波妨害を与えるのを防ぐことができる。実施例のように透明板に反射防止処理を施せば、この透明板が電磁界輻射ノイズと光の反射と機械的な保護の3つの機能を果たすことになる。

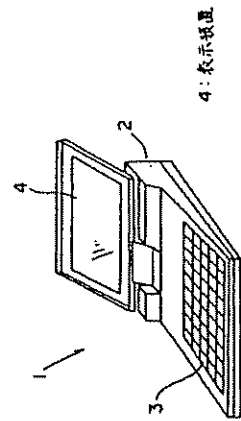
よって、本発明によれば電磁界輻射ノイズを防止する等、種々の優れた特徴を備えた表示装置を提供することができる。

4. 図面の簡単な説明

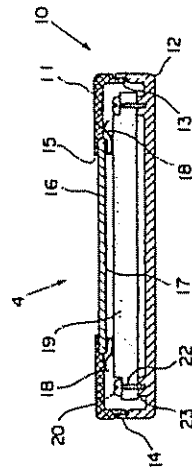
第1図は本発明実施例の構成説明図、第2図は表示装置の断面説明図、第3図は透明板の拡大断面図、第4図は表示装置の分解斜視図、第5図は従来の表示装置の構成を示す断面説明図である。

図において、(1)は電子機器、(2)は制御部、(3)はキーボード、(4)は表示装置、(10)はケース、(11)は前面カバー、(12)は背面カバー、(13)及び(14)はソメ、(15)は表示窓、(16)は透明板、(17)は透明導電層、(18)は接触片、(19)はディスプレイ、(20)は固定ネジ、(21)は有効表示領域、(22)は取付孔、(23)は受座である。

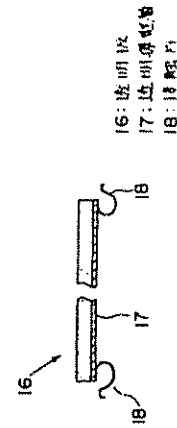
特開平4-134900(4)



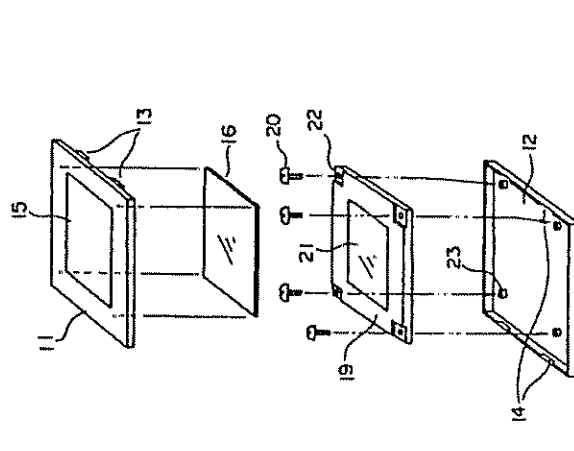
本発明の構成説明図
第1図



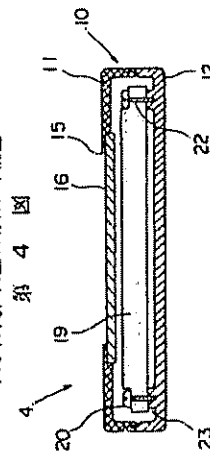
本装置の断面説明図
第2図



透明板の拡大断面図
第3図



本発明表示装置の分解斜視図
第4図



従来の表示装置の断面説明図
第5図

EXHIBIT D

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

LG.PHILIPS LCD CO., LTD.,)
)
Plaintiff,)
)
vs.)
)
TATUNG CO.; TATUNG COMPANY)
OF AMERICA, INC.; AND)
VIEWSONIC CORPORATION,)
)
Defendants.)

No. 04-343

ORIGINAL

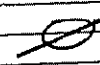
received
8/13/04

VIDEOTAPED DEPOSITION OF WILLIAM K. BOHANNON

Costa Mesa, California

Friday, August 6, 2004

Reported by:
LINDA A. BANKEY
CSR No. 7993
Job No. 901197

RECEIVED-LA CALENDAR	
September 1, 2004	
c/m#	220329103
Dates to be Entered	
	
The attorney, whose initials appear below, has reviewed the applicable court rules, and has verified that the above dates are correct.	
Atty:	
Date Processed:	7/1
Rec'd: Mail/In Box/Fax/Record/Critrun or Other:	11/3
Routed to:	T. Roman
Processed by:	CVL

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

LG.PHILIPS LCD CO., LTD.,
Plaintiff,
vs.
TATUNG CO.; TATUNG COMPANY
OF AMERICA, INC.; AND
VIEWSONIC CORPORATION,
Defendants.

No. 04-343

Videotaped deposition of
WILLIAM K. BOHANNON, taken on
behalf of Defendants, at 600 Anton
Boulevard, 18th Floor, Costa Mesa,
California, beginning at 10:21 a.m.
and ending at 7:06 p.m. on Friday,
August 6, 2004, before LINDA A.
BANKEY, Certified Shorthand Reporter
No. 7993.

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INDEX

WITNESS

EXAMINATION

WILLIAM K. BOHANNON

BY MS. ROMAN

7

EXHIBITS

DEFENDANTS'

PAGE

1	Notice of Deposition of William K. Bohannon;	19
6	pages	
2	U.S. Patent 6,501,641 B1; 23 pages	31
3	U.S. Patent 6,498,718 B1; 22 pages	31
4	Color Xerox of ViewSonic product; 5 pages	43
5	Handwritten notes; 9 pages	59
6	Document in Japanese for Patent 4-134900;	76
4	pages	
7	Declaration of William K. Bohannon; 27 pages	86
8	Specification of FDTC TFT-LCD module;	125
38	pages	
9	Drawing (not labeled); 2 pages	193
10	Typed notes; 5 pages	219
11	Notice of Allowability, Application	222
No. 09/444,376;	4 pages	
12	Notice of Allowability, Application	230
No. 09/285,338;	3 pages	

02:19 1 Q Right. Other than what you have shown me as
2 14g as an example of a first frame, what else do you
3 understand a first frame to mean in the context of
4 claim 35?

02:19 5 MR. JARCHO: Objection. Foundation. I don't
6 believe he's testified that 14g is a first frame.

7 BY MS. ROMAN:

8 Q What does a "first frame" mean in the context
9 of claim 35?

02:20 10 A Let me go back and find my claim.

11 So do you want to repeat that question, please?

12 Q Sure. What's a "first frame"?

13 A Well, the "first frame" is the -- is the -- you
14 know, this part at the -- at the last -- I'm pointing to
02:20 15 14g here -- that has a fastening component. It has the
16 fastening element as described in the claim -- the
17 fastening element at the -- at the rear -- the fastening
18 part at the rear surface of this -- of this frame.

19 Q And the first frame, as you understand it to be
02:20 20 defined in claim 35, is part of the backlight unit?

21 A That's -- it's -- it's -- I don't agree with
22 that terminology.

23 Q Okay. What do you not agree with?

24 A That it -- that the backlight unit -- it's
02:21 25 including the first frame.

1 Q What does "including" mean as you understand it
2 in the claim 35?

3 A That -- that the backlight unit includes a
4 first frame.

5 Q Do you understand "include" in that context to
6 mean that the backlight unit has as one of its
7 components a first frame?

8 A Yes.

9 Q You mentioned the "fastening part at the rear
10 surface of the first frame."

11 A Yes.

12 Q What is a "fastening part"?

13 MR. JARCHO: Within the meaning of claim 35?

14 MS. ROMAN: Yes.

15 THE WITNESS: So the -- the "fastening part" on
16 the first frame allows the first frame to be fastened
17 from the -- from the rear to the -- to the back of the
18 case. So there's a variety of things that could be a
19 fastening part.

20 BY MS. ROMAN:

21 Q What kinds of things can be fastening parts in
22 the context of claim 35?

23 A The screw hole for just one example.

24 Q Can you give me another example?

02:22 25 A The hole without threads.

03:35 1 Q If it's a through-hole, does it have to include
2 something else to be a fastening part?

3 A I don't think so.

4 Q Does the specification of the '641 patent
03:35 5 identify anywhere where a through-hole alone serves as
6 the fastening part?

7 A A through-hole alone serves as the -- as the
8 fastening part?

9 Q Yes.

03:36 10 A So if we look on -- on column -- column 4,
11 line 50, which you have already read, it talks about
12 "through-hole, or similar conveniently descriptive term,
13 which together with the material defining the hole may
14 be referred to as a fastening element."

03:36 15 Q Can a hole -- a through-hole by itself fasten
16 something to something else?

17 A I'm not sure I understand your question.

18 Q Does a through-hole by itself without an
19 additional fastening part of some sort such as a screw
03:37 20 or -- or a peg -- does a through-hole in and of itself
21 allow you to join two pieces together?

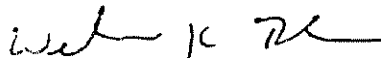
22 A A hole in space? I'm -- I'm not sure I
23 understand.

24 Q A through-hole as you have just read to me from
03:37 25 column 4 as it can be defined together with the material

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I, WILLIAM K. BOHANNON, do hereby declare under penalty of perjury that I have read the foregoing transcript; that I have made any corrections as appear noted, in ink, initialed by me, or attached hereto; that my testimony as contained herein, as corrected, is true and correct.

EXECUTED this 25 day of August,
2004, at Poway, California.
(City) (State)



WILLIAM K. BOHANNON

236

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BINGHAM MCCUTCHEN

1
2
3
4 I, the undersigned, a Certified Shorthand
5 Reporter of the State of California, do hereby
6 certify:

7 That the foregoing proceedings were taken
8 before me at the time and place herein set forth; that
9 any witnesses in the foregoing proceedings, prior to
10 testifying, were placed under oath; that a verbatim
11 record of the proceedings was made by me using machine
12 shorthand which was thereafter transcribed under my
13 direction; further, that the foregoing is an accurate
14 transcription thereof.

15 I further certify that I am neither
16 financially interested in the action nor a relative or
17 employee of any attorney of any of the parties.

18 IN WITNESS WHEREOF, I have this date
19 subscribed my name.

20
21 Dated: AUG 12 2004

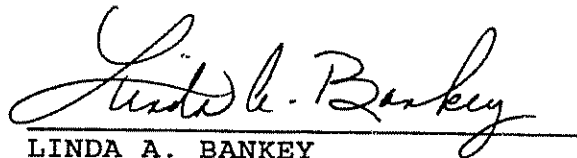
22
23 
24 LINDA A. BANKEY
25 CSR No. 7993

EXHIBIT E



US005119204A

United States Patent [19]

Hashimoto et al.

[11] Patent Number: **5,119,204**[45] Date of Patent: **Jun. 2, 1992**

[54] **LIQUID CRYSTAL TELEVISION SET
HAVING DRIVING CIRCUIT ON
PERIPHERAL PORTION AND METHOD OF
FABRICATION OF IMAGE DISPLAY
SECTION**

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[52] U.S. Cl. 358/254; 358/241

[58] Field of Search 340/718, 719; 358/254,
358/236, 241; 350/345

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Primary Examiner—James J. Groody

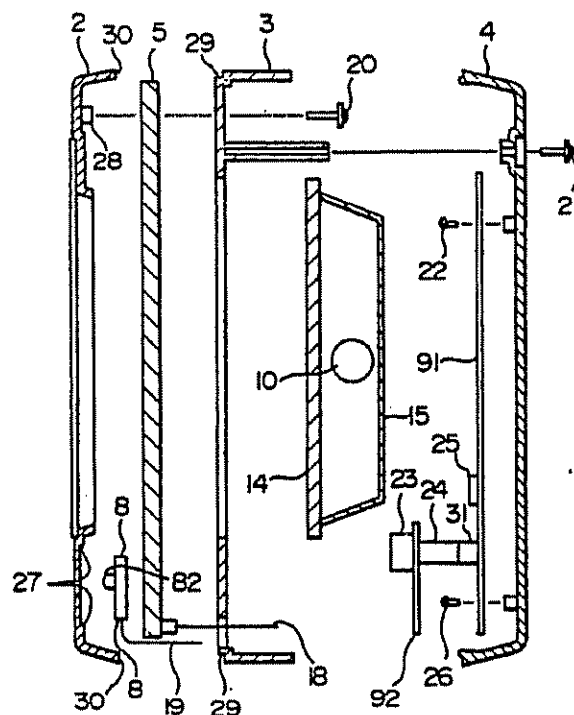
Assistant Examiner—Mark R. Powell

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[57] ABSTRACT

In a liquid crystal TV set, a liquid crystal panel includes an image display section constituted by a liquid crystal for displaying an image and a peripheral portion of the image display section having horizontal and vertical scanning circuits for driving the liquid crystal. A operating unit having a plurality of switches is arranged on the front of the peripheral portion. The switches of the operating unit includes at least a thin key switch are arranged in matrix. This construction permits the liquid crystal panel to be arranged in the same plane as the operating unit, reducing both the size of a liquid crystal TV set and the number of assembly steps thereof at the same time.

20 Claims, 6 Drawing Sheets



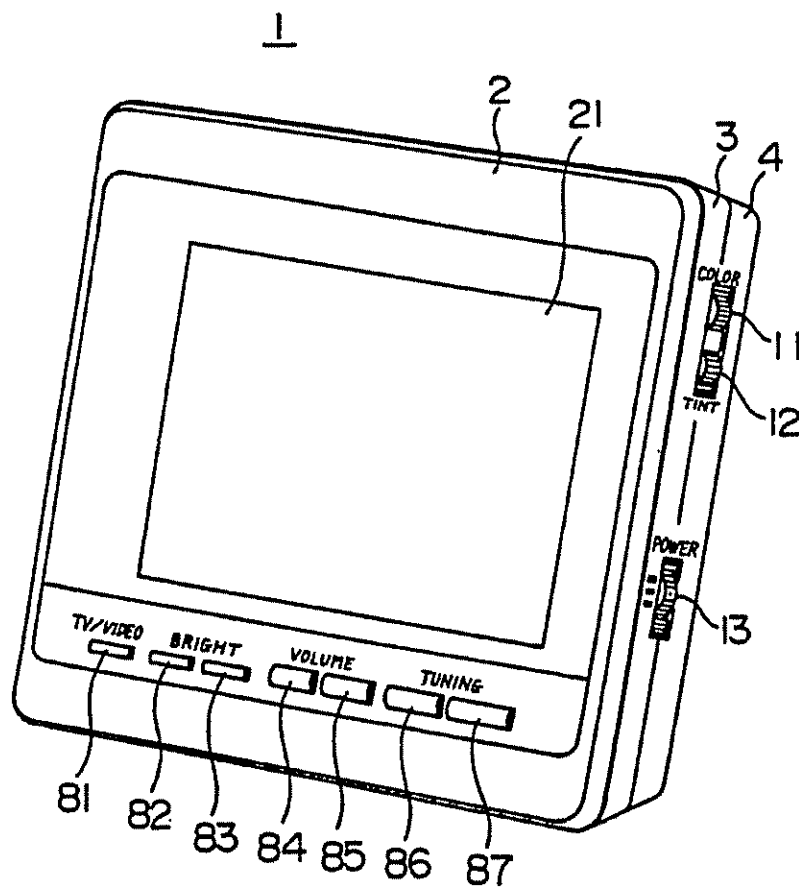
U.S. Patent

June 2, 1992

Sheet 1 of 6

5,119,204

FIG. 1



U.S. Patent

June 2, 1992

Sheet 2 of 6

5,119,204

FIG. 2

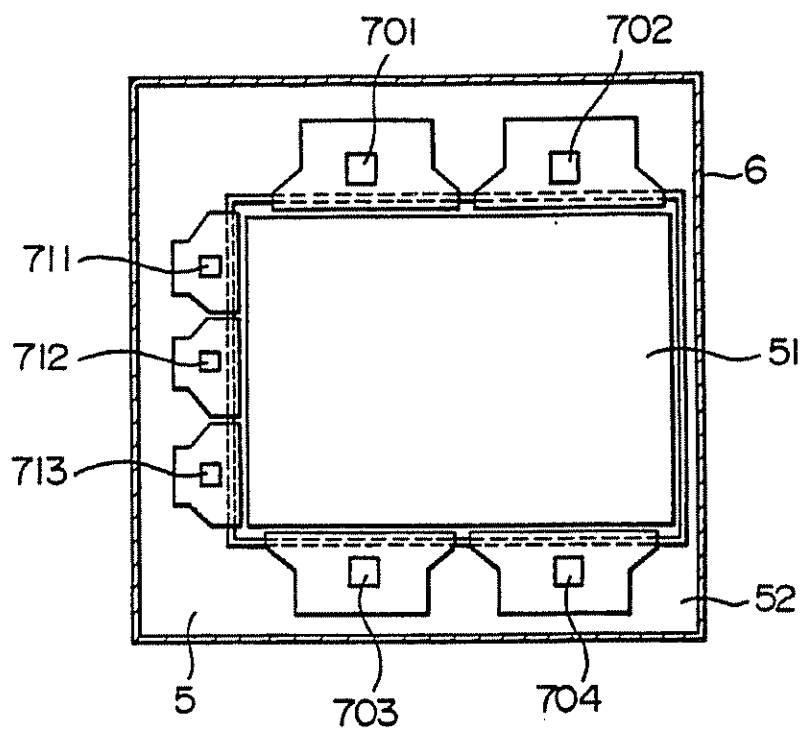
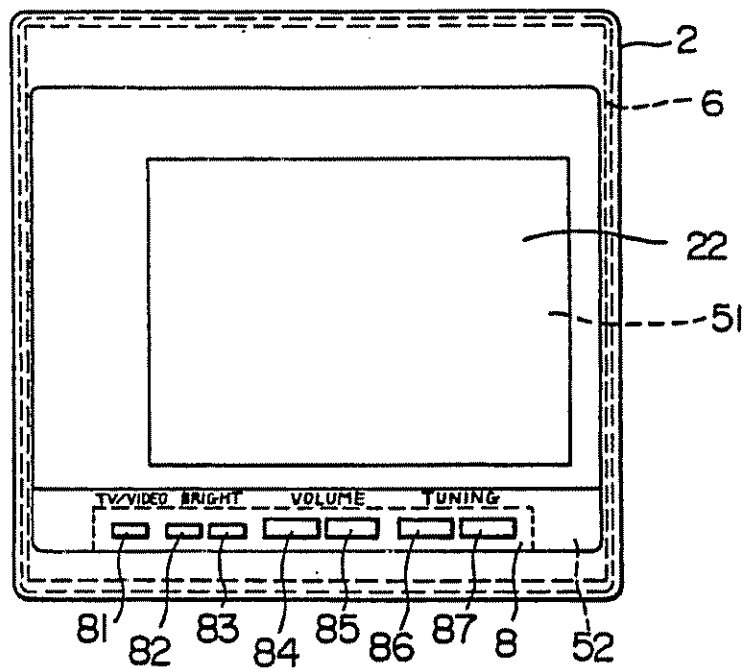


FIG. 3



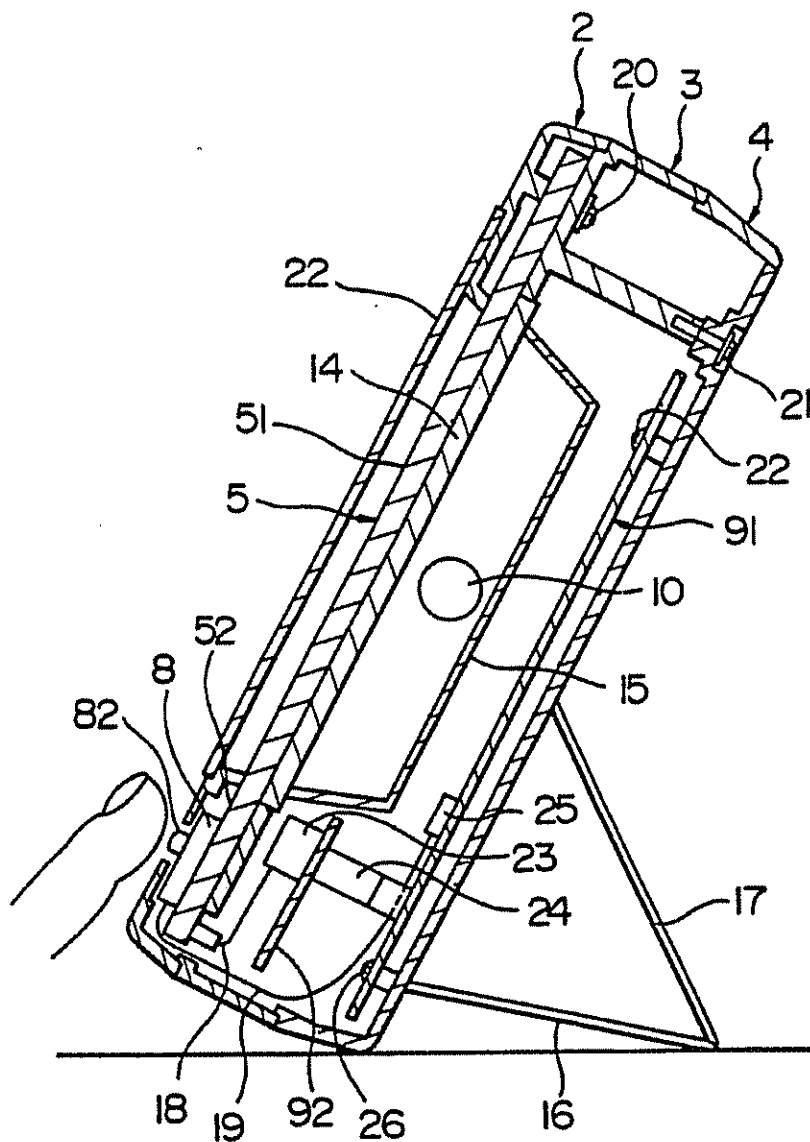
U.S. Patent

June 2, 1992

Sheet 3 of 6

5,119,204

FIG. 4



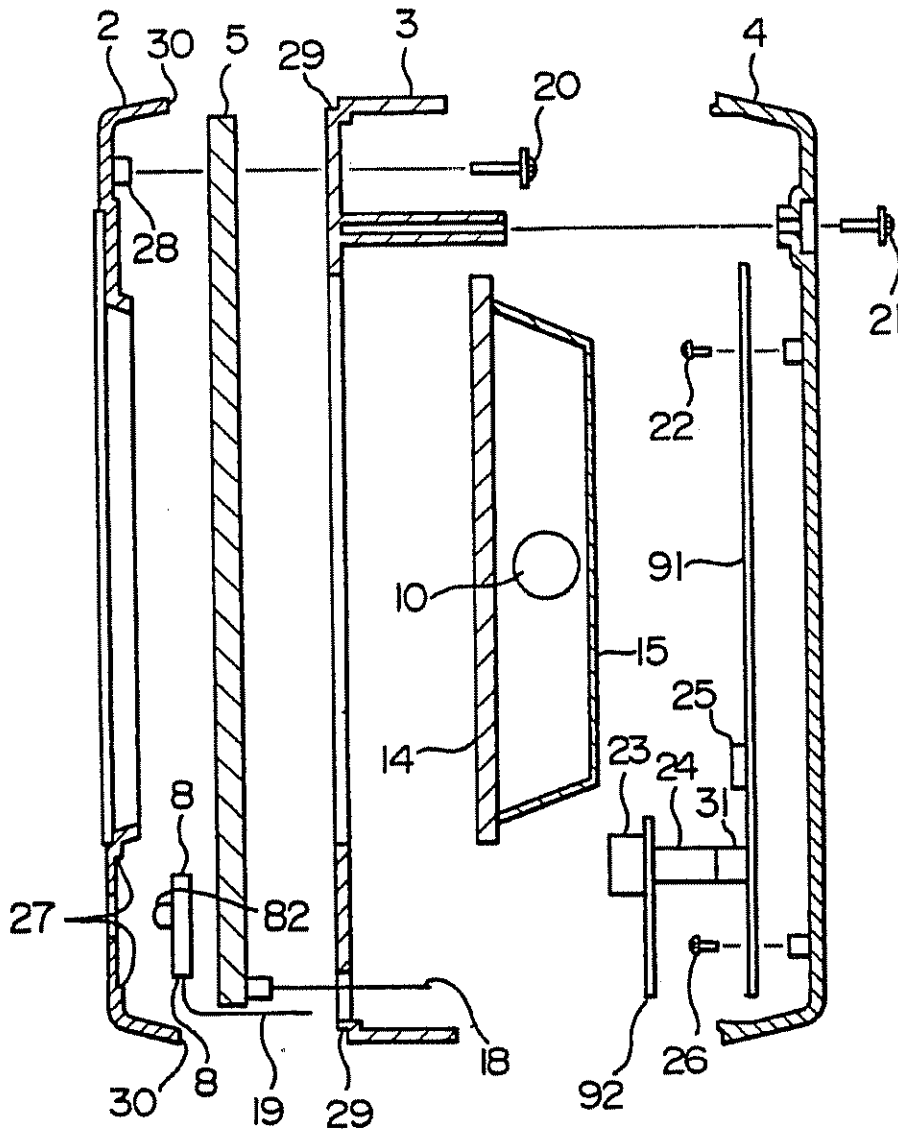
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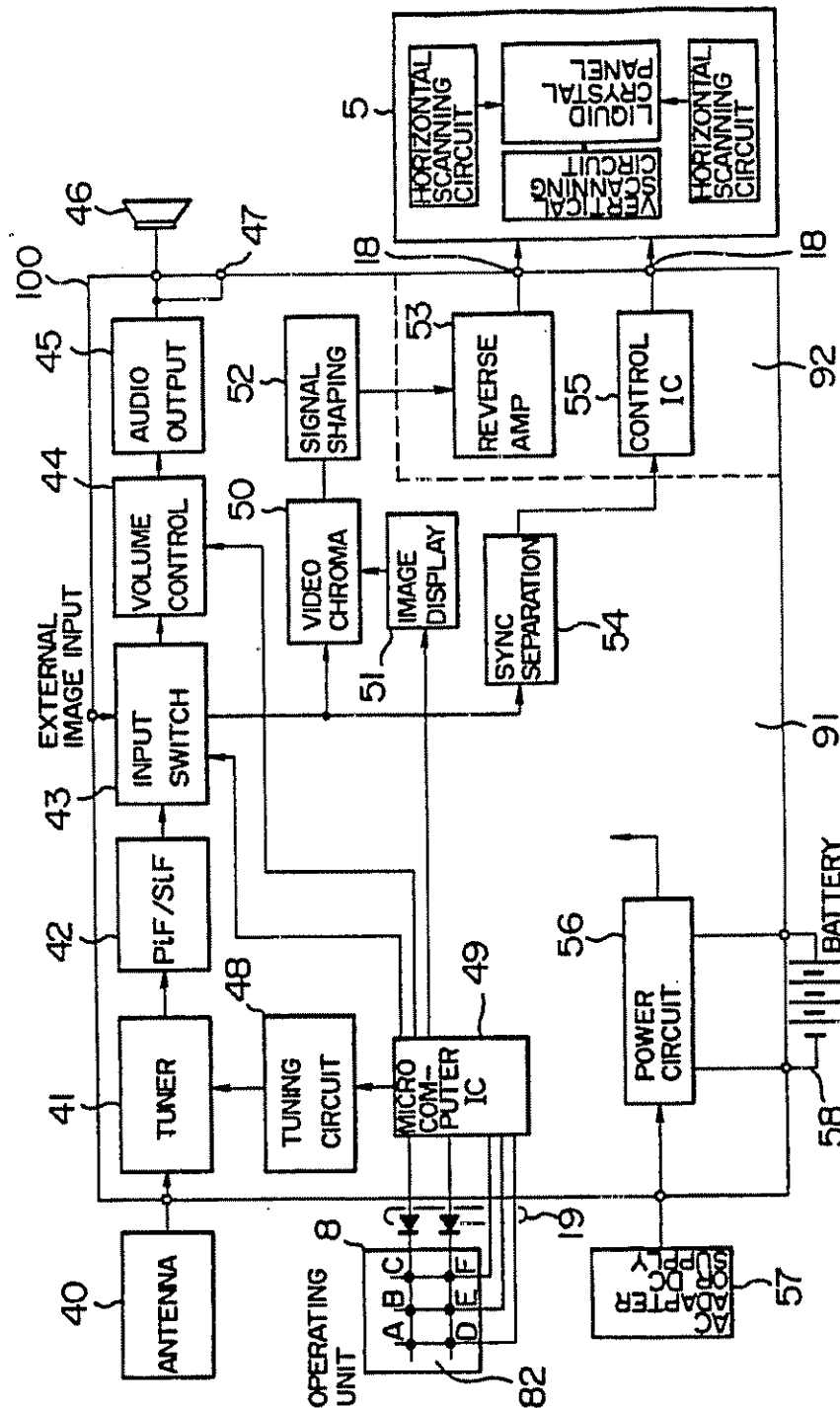
Sheet 4 of 6

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FIG. 5



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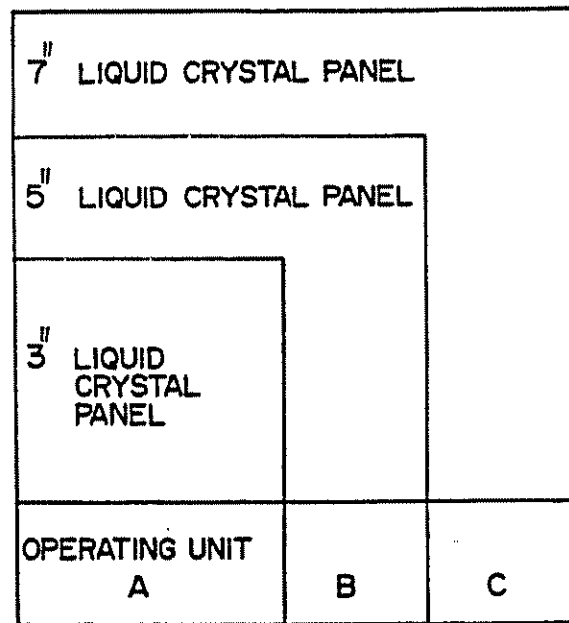
U.S. Patent

June 2, 1992

Sheet 6 of 6

5,119,204

FIG. 7



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1

LIQUID CRYSTAL TELEVISION SET HAVING DRIVING CIRCUIT ON PERIPHERAL PORTION AND METHOD OF FABRICATION OF IMAGE DISPLAY SECTION

BACKGROUND OF THE INVENTION

The present invention relates to a liquid crystal television set, and more in particular, to a liquid crystal television set and a method of fabrication thereof having a feature in the arrangement of an operating unit thereof.

Conventional liquid crystal television sets have an operating unit arranged on other than the liquid crystal panel as viewed from the front, as disclosed, for example, in JP-A(U)-61-94883. The front outline of such liquid crystal television sets thus requires a total area more than the sum of the areas of the liquid crystal panel and the operating unit.

The aforementioned fact that an area more than the sum of the areas of the liquid panel and the operating unit is required for the front outline of a liquid crystal television set does not pose any problem so far as the television set is as small as two or three inches the in diagonal line of the liquid crystal panel. For liquid crystal panel sizes of four inches or more, however, such a fact poses a bottleneck against reducing the outline of a liquid crystal television set.

SUMMARY OF THE INVENTION

A first object of the present invention is to provide a compact liquid crystal TV set small in outer size even if the liquid crystal panel thereof is large in size.

A second object of the present invention is to provide a method of fabricating a liquid crystal TV set convenient to assemble.

The first object is achieved by arranging an operating unit on the front of the peripheral portion other than the image display section of a liquid crystal panel.

The second object is achieved by holding an operating unit between a top case and a liquid crystal panel, mounting a center case thereon, securing the top case and the center case to each other, and securing a bottom case fixedly carrying a circuit board inside.

According to one aspect of the present invention, there is provided a liquid crystal TV set, in which the arrangement of an operating unit within the size of the liquid crystal panel reduces the outer size of the TV set to a minimum necessary for housing the liquid crystal panel, and the construction of a thin operating unit permits it to be located in a clearance between a shield case of the liquid crystal panel and a TV case, thus assuring a small depth of the TV set.

According to another aspect of the present invention, there is provided a method of fabricating a liquid crystal TV set, in which a plurality of cases, a liquid crystal panel, an operating unit, and other parts are assembled sequentially for an improved assembly efficiency.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an outside view of a liquid crystal TV set according to an embodiment of the present invention.

FIG. 2 is a sectional view of a liquid crystal panel configuration of the liquid crystal TV set shown in FIG. 1.

2

FIG. 3 is an outer front view showing the manner in which a liquid crystal panel is housed in the liquid crystal TV set of FIG. 1.

FIG. 4 is a side sectional view showing the operating conditions of the liquid crystal TV set shown in FIG. 1.

FIG. 5 is an exploded side sectional view of the liquid crystal TV set shown in FIG. 1.

FIG. 6 is a block diagram showing a circuit configuration of the liquid crystal TV set of FIG. 1.

FIG. 7 is a diagram showing an area ratio between the liquid crystal panel and the operating unit of conventional liquid crystal TV sets.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

An embodiment of the present invention will be explained below with reference to FIGS. 1 to 6.

An outer perspective view of a liquid crystal TV set according to the present invention is shown in FIG. 1. The housing of a liquid crystal TV set 1 is formed of three cases including a top case 2, a center case 3 and a bottom case 4. The top case 2 has a front plate 21 of a transparent material attached thereto. As shown by dashed lines in FIG. 3, a screen or image display section 51 of the liquid crystal panel 5 is seen through the front plate 21.

The top case 2 has operating switches 81, 82, 83, 84, 85, 86, 87 in key form at the lower part. These operating switches 81, 82, 83, 84, 85, 86, 87 are arranged above the lower peripheral portion of the liquid crystal panel described later. Each of the operating switches 81, 82, 83, 84, 85, 86, 87 is operated so frequently as to affect the operability of the TV set. The operating switch 81 is for switching television and VTR (video tape recorder) monitor. A touch of the operating switch 81 starts the function of television and another touch that of a VTR monitor. These operations will be explained in detail later with reference to the block diagram of FIG. 6. The operating switches 82, 83 are for adjusting the brightness. When the left operating switch 82 is pressed, the brightness is decreased, and the brightness continues to be decreased if this switch is kept depressed. At the press of the operating switch 83, on the other hand, the brightness progressively increases. The operating switches 84, 85 are for regulating the sound volume. If the left switch 84 is pressed, the sound volume decreases, and upon continued depression, the sound volume continues to decrease. The operating switch 85 is for increasing the sound volume upon depression thereof. The operating switches 86, 87 are for tuning. Press the left operating switch 86, and the channel number selected by the tuner is decreased in number, and the continued depression thereof progressively decreases the channel number. The operating switch 87 is for progressively increasing the channel number upon depression thereof.

The liquid crystal TV set has on the right side of the body thereof control units lower in operating frequency than the operating switches 81, 82, 83, 84, 85, 86, 87. These control units are mechanical switches either of knob or change-over type. A knob 11 is for regulating the color darkness, and by rotating this knob upward or downward, the color darkness is regulated. A knob 12, which is for regulating the hue, is adapted for turning upward or downward to adjust the hue. A knob 13 provides a power switch operable in three stages. By sliding this switch upward or downward, the on-off of power and the charging conditions are switchable.

5,119,204

3

Although not shown in the drawing, a slide switch for switching VHF and UHF bands is disposed on the top of the body of the liquid crystal TV set. Input-output terminals of the TV set include an external antenna terminal on the top of the liquid crystal TV set body, and a video input terminal, an earphone terminal and an external power terminal on the left side of the TV set body. A contractable antenna of rod type is also mounted on the top of the liquid crystal TV set although not shown in the drawing.

A front partial sectional view of the liquid crystal panel 5 is shown in FIG. 2. The liquid crystal panel 5 normally includes an image display section 51 made of transparent glass electrodes holding liquid crystal therebetween for displaying an image, and a peripheral section 52 having arranged thereon horizontal scanning units 701, 702, 703, 704 and vertical scanning units 711, 712, 713 for driving the image display section 51. The peripheral section 52 is covered with a metal shield plate 6 for preventing leakage of the scanning signal to an external unit. As a result, in appearance, the liquid crystal panel 5 has a part of the shield plate 6 cut away and the image display section 51 of the liquid crystal panel exposed from the central part.

The horizontal scanning units 701, 702 are for controlling the pixels of odd-numbered lines and the horizontal scanning units 703, 704 for controlling those of even-numbered lines. The horizontal scanning units for the odd- and even-numbered lines are divided into two parts respectively. A liquid crystal panel five inches in diagonal line has 480 horizontal scanning lines.

The vertical scanning units 711, 712, 713 include three portions, and there are 240 vertical scanning lines for a liquid crystal panel five inches in diagonal line.

The horizontal scanning units, instead of being divided into two parts, may be provided only under the image display section 51 of the liquid crystal panel without being divided. In such a case, the peripheral portion 52 is positioned in the form of L but not in the form of channel as shown in FIG. 2. Also, the vertical scanning units may be divided into two parts on the right and left sides.

A front view of a liquid crystal TV set body is shown in FIG. 3. The liquid crystal panel 5 arranged inside of a top case 2 is shown by dashed line. Specifically, the image display section 51 is visible through a transparent front plate 21 and has an image displayed thereon. An operating unit 8 including operating switches 81, 82, 83, 84, 85, 86, 87 of key type are arranged on the peripheral portion 52 of the liquid crystal panel 5.

FIG. 4 shows a side sectional view of the liquid crystal TV set body. The liquid crystal panel 5 is mounted between the top case 2 and the center case 3. The operating unit 8 including the operating switches 81, 82, etc. is arranged between the top case 2 and the shield case 6 covering the peripheral portion 52 of the liquid crystal panel 5 along the peripheral portion 52 under the liquid crystal panel 5. Protrusions 81 of the operating switches 81, 82, etc. are projected from the top case 2 so that the protrusions 81 are adapted for pressing operation from the front side.

Also, circuit boards 91, 92 and a back light 10 are mounted between the center case 3 and the bottom case 4.

The back light 10 has a diffusion plate 14 at the front part thereof in contact with the image display section 51 of the liquid crystal panel 5 thereby to render uniform the light from the back light 10 and from the reflector

4

15 behind the same. The back light 10 uses a single straight tube which may be replaced by a U-shaped tube or a couple of straight tubes as required with equal effect.

The circuit boards include a main board 91 and a subordinate board 92, which are connected to each other by a post 24 having a lead wire built therein. The subordinate board 92 carries thereon a control section for controlling the liquid crystal panel 5 as described later. The vertical and horizontal scanning circuits of the liquid crystal panel 5 are connected to a connector 18, which in turn is connected to a connector 23 on the subordinate board 92 by a flexible board 18. The operating unit 8 including the operating switches 81, 82, etc. are also connected to a connector 25 on the main board 91 by a flexible board 19.

The top case 2 and the center case 8 are secured by a screw 20, with the result that the liquid crystal panel 5 is fixedly positioned between the top case 2 and the center case 3. The main board 91 is fixedly disposed on the bottom case 4 by screws 22, 26. The bottom case 4 is secured fixedly on the center case 3 by a screw 21. The back light 10, the diffusion plate 14 and the reflector 15 fixed integrally to each other are secured fixedly on the center case 3.

The bottom case 4 has mounted thereon stands 16, 17 foldable in two parts. These stands 16, 17 are bent as shown in their use with the angles thereof adjustable in three stages. The stages of angle for adjustment may alternatively be more than three. The stands 16, 17 are adapted to be extended and held in straight form in close contact with the bottom case 4 when not in use.

The operating unit 8 is arranged under the front part of the liquid crystal TV set. When the protrusion 82 of the operating unit 8 is pressed by finger as shown in FIG. 4, therefore, the stands 16, 17 are positioned along the direction in which the force is applied by the finger, thus assuring the stability and the operating ease of the liquid crystal TV set.

The position of the operating unit 8 may alternatively be on the left side or above the image display section 51 in FIG. 2, provided, however, that it must be located on the peripheral portion 52.

In the case of a stand of a type not held on the desk but hung on the wall or the like, the operating unit 8 arranged above or on the left side of the image display section 51 might be more easily operable depending on relative positions of the operator and the liquid crystal TV set. The arrangement may alternatively be determined from the standpoint of design appeal.

FIG. 5 is an exploded sectional view showing steps of fabricating the liquid crystal TV set. First, the operating unit 8 is fitted in position at stepped portions 27 below the top case 2 to project a protrusion 82 of the operating unit 8 from the hole of the top case 2.

Then, the recess (not shown) of the liquid crystal panel 5 is fitted in the upper protrusion 28 of the top case 2 to set the liquid crystal panel 5 in position. The center case 3 is mounted on this assembly. Relative positions of the assembly and the center case 3 are secured by stepped portions 29 on the outer periphery of the center case 3 and an output periphery 30 of the top case 2. After that, the top case 2 and the center case 3 are secured by screws 20. Out of the screws 20 including two upper screws and two lower screws, the lower ones are not shown in the drawing and one of the upper screws is hidden behind shown screw 20. The back light 10, the diffusion plate 14 and the reflector 15, after being

image display section

7 bl fixed

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fixed integrally, are secured on the center case 3 by being pressed on the center case 3. The bottom case 4, on the other hand, is assembled in the manner mentioned below. Specifically, the main board 91 is fixed on the bottom case 4 by screws 22, 26. The main board 91 has fixed thereon a connector 31. A lead wire built in the connector 31 and exposed from the ends of the latter is inserted in a post 24 to secure the connector 31. The lead wire exposed from the other end of the connector 31 is inserted into the hole of the subordinate board 92 and soldered therein. The IC and the like on the subordinate board 92 are connected with the lead wire by a printed wiring formed on the subordinate board 92. After this assembly work, the flexible wiring 18, 19 are connected to the connectors 23, 25. The assembly unit of the top case 2 and the center case 3 is fixedly secured to the bottom case 4 by a screw 21.

As described above, the top case, the operating unit, the liquid crystal panel and the center case are mounted to fix the top case with the center case as a first step; a back light unit including the back light, the diffusion plate and the reflector is secured on the center case as a second step; a circuit board is secured in the bottom case as a third step; and the bottom case is fixed on the center case as a fourth step. The assembly process for fabrication involving only these four steps improves the assembly efficiency.

The conventional methods of fabricating a liquid crystal TV set, in contrast, requires six steps of securing a liquid crystal panel on a top case (first step), fixing an operating unit on the top case (second step), fixing a back light unit on a center case (third step), securing a top case on the center case (fourth step), fixing a circuit board on a bottom case (fifth step), and finally fixing the bottom case on the center case (sixth step).

The back light unit may alternatively be mounted on the bottom case 4.

A block diagram of a liquid crystal TV set according to an embodiment of the present invention is shown in FIG. 6. The liquid crystal TV set 100 receives a broadcasting wave at a tuner 41 through an antenna 40, and produces a video-audio signal of a channel (frequency) selected by a tuning circuit 48. This signal is separated into a video signal and an audio signal at a video-audio intermediate frequency amplifier circuit 42. A signal from the video-audio intermediate frequency amplifier circuit 42 and a signal from an external video unit are produced by being selected at an input change-over circuit 43. The audio signal is applied to a speaker 46 through an volume control circuit 44 and an audio output circuit 45. The audio signal is also led to an earphone terminal 47 as a signal audible by earphone. The video signal, on the other hand, is demodulated into a primary color signal by a video/chroma circuit 50, and subjected to γ -compensation at a signal shaping circuit 52. Further, a polarity-reversed signal is taken out from a reverse amplifier circuit 53, and applied to a horizontal scanning circuit through the vertical and horizontal scanning circuits of the liquid crystal panel 5. A screen display circuit 51 is for displaying characters on the screen and applies a control signal to the video/chroma circuit 50. The video signal applied to the sync separator circuit 54, on the other hand, is converted into horizontal and vertical sync signals and applied to a control IC 55. An output signal from the control IC 55 is applied through a flexible wiring 18 to the scanning circuit of the liquid crystal panel 5 thereby to effect timing control of the vertical and horizontal operations.

6

The reverse amplifier circuit 53 and the control IC 55 are provided on the subordinate board 92, and the remaining circuits on the main board 91.

The power circuit 56 is supplied with a DC voltage from a DC power supply 57 such as an AC adapter, a DC power supply of a battery 58, and a controlled output voltage is supplied to each circuit. Further, a microcomputer 49 is used for control operations by the operating unit 8 including tuning, sound volume control, screen display and TV/video change-over.

The operating unit 8 includes sound volume control switches 81, 82, 83, 84, 85, 86, 87, the contacts of which correspond to A, B, C, D, E, F, etc in FIG. 6 respectively. The functions of these switches are discriminated by a key matrix signal from the microcomputer 49. Specifically, a scanning signal is sent from the microcomputer 49 sequentially through a diode, so that upon depression of a given contact of the switches, the scanning signal is read into the microcomputer 49, thus identifying the particular contact from the data on the line by way of which the scanning signal is read and the data on the timing at which it is read. As a result, the operating unit requires no circuit parts other than the key switches and is thus constructed in this form.

Depending on the type of switch depressed, the microcomputer 49 sends a control signal to the tuning circuit 48, the input change-over circuit 43 and the screen display circuit 51 thereby to effect control as desired by the operator.

The key switch used in the embodiment under consideration is defined not as the one capable of self-holding a physical condition of binary or higher state, but as the one which has a contact thereof closed only during depression with its made discriminated by a read signal from the key matrix circuit. By using such a key switch, the operating unit is made thin, thereby making it possible to arrange a plurality of such switches in the space between the top case 2 and the liquid crystal panel 5.

The key switch in the form of key top providing a protrusion used in this embodiment may be replaced with equal effect by a key switch in sheet form generally used with a card-type calculator or the like. Also, instead of the contacts, a device producing a binary state according to capacity change may be used.

In the case where there is some margin of space between the top case 2 and the liquid crystal panel 5, the key switch may be superseded by a switch of such a type that the contact thereof is closed when given a touch to hold a state and opened when given another touch. The size of the liquid crystal TV set may be equally reduced even by use of the latter type of switch.

The number of key switches is not limited to seven as in the present embodiment, but may be increased or decreased as desired. Further, the other types of switch such as zoom switch may be arranged on the front portion, the space permitting. Each switch should have a width slightly greater than the human finger to assure an operating ease and prevent a depression error even if adjacent switches are located closely to each other. The number of switches arranged in juxtaposition is determined by the lateral width of the liquid crystal TV set proper, the width of the switches and the distance between adjacent switches. If it is desired to arrange more switches on the front portion, they are preferably disposed in stages or divided into the upper and lower sides or the left and right sides of the image display section.

5,119,204

7

According to the present invention, the front outline of a liquid crystal TV set is reduced substantially to the size of a liquid crystal panel, and therefore even a liquid crystal TV set having a large screen may be produced in compact form.

Further, the fact that the operating unit may be arranged in the space between the top case and the shield case prevents the TV set from thickening.

Furthermore, since the operating unit is located in the same plane as the screen, high visibility, pressing ease and stable operation are assured at the same time.

If the operating unit is arranged on other than the liquid crystal panel as in the conventional liquid crystal TV sets, the area occupied by the operating unit would increase with the size of the liquid crystal panel due to the fact that the liquid crystal TV set is usually rectangular in shape requiring a side of the operating unit equal in size to one side of the liquid crystal panel. Specifically, as shown in FIG. 7, a 3-inch liquid crystal panel would require an operating unit of the size A; a 5-inch liquid crystal panel, the size A + B; and a 7-inch liquid crystal panel, the size A + B + C. According to the present invention, in contrast, the area of the operating unit remains substantially the same regardless of the size of the liquid crystal panel because the operating unit is arranged along the peripheral portion of the liquid crystal panel.

We claim:

1. A liquid crystal TV set comprising a liquid crystal panel including both an image display section constructed of a liquid crystal for displaying and a peripheral portion located around said image display section, a scanning circuit for driving the liquid crystal of said image display section being arranged on said peripheral portion of said liquid crystal panel in substantially a plane of said image display section, said TV set further comprising operation means having a plurality of switches arranged on the front part of said peripheral portion of said liquid crystal panel and overlying at least a portion of said scanning circuit.

2. A liquid crystal TV set according to claim 1, wherein the switches of said operating means are of thin key type.

3. A liquid crystal TV set according to claim 2, wherein said key switches constitute a matrix, and a key switch depressed is discriminated according to a key matrix signal applied from control means.

4. A liquid crystal TV set according to claim 1, wherein said operating means is disposed at a lower portion of the front part of the TV set, said TV set further comprising at least a stand for holding the body of the TV set, said stand being arranged on the back of the body.

5. A liquid crystal TV set according to claim 1, wherein said peripheral portion of said liquid crystal panel has at least two subsections including at least a selected one of right and left sides of the image display section and at least a selected one of upper and lower sides of the image display section.

6. A liquid crystal TV set according to claim 1, wherein one of the switches of the operating means is for tuning.

7. A liquid crystal TV set according to claim 1, wherein one of the switches of the operating means is for controlling the brightness of the screen.

8. A liquid crystal TV set according to claim 1, wherein one of the switches of the operating means is for controlling the sound volume.

8

9. A liquid crystal TV set according to claim 1, wherein one of the switches of the operating means is for switching the functions between television and VTR monitor.

10. A method of fabricating a liquid crystal TV set comprising the steps of:

holding operating means for the TV between a top case and a liquid crystal panel;

mounting a center case on the top case and fixing the top case and the center case;

fixing at least a circuit board in a bottom case; and

fixing the bottom case on selected one of the top case and the center case.

11. A method according to claim 10, further comprising the step of fixing a back light unit including a back light, a diffusion plate and a reflector on the center case.

12. A method according to claim 10, further comprising the step of setting the operating means in position by at least a stepped portion of the top case.

13. A method according to claim 10, further comprising the step of setting the liquid crystal panel in position by a protrusion formed on the top case.

14. A method according to claim 10, further comprising the step of setting the top case in position by at least a stepped portion of an outer peripheral portion of the center case.

15. A method according to claim 10, further comprising the step of holding the operating means and the liquid crystal panel between the top case and the center case by fixing the top case and the center case.

16. A liquid crystal TV set comprising:

image display means including a liquid crystal for displaying an image;

peripheral means arranged on the peripheral portion of the image display means and including horizontal scanning circuits for driving the liquid crystal; a liquid crystal panel including the image display means and the peripheral means;

operating means arranged in the same plane as the peripheral means of the liquid crystal panel and including a plurality of switches and overlying at least a portion of the horizontal scanning circuits; and

a case for housing the image display means and the operating means;

said operating means being held between the case and liquid crystal panel;

said operating means having switches including a thin switch and constituting a matrix.

17. A method of fabricating a liquid crystal TV set comprising a top case, a center case and a bottom case; said method comprising the steps of:

setting operating means having a plurality of switches in position on the top case by at least a stepped portion of the top case;

setting a liquid crystal panel in position on the top case by a protrusion formed on the top case;

setting the top case in position by at least a stepped portion formed on the outer periphery of the center case;

holding the operating means and the liquid crystal panel between the top case and the center case by fixing the top case and the center case;

fixing a back liquid unit including a back light, a diffusion plate and a reflector on the center case; and

5,119,204

9

fixing the bottom case having at least a circuit board
fixed therein, on selected one of the top case and
the center case.

18. A liquid crystal TV set according to claim 1,
wherein the switches are manually operable switches.

19. A liquid crystal TV set according to claim 18,

10

wherein said liquid crystal panel has a diagonal dimen-
sion of at least 3 inches.

20. A liquid crystal TV set according to claim 16,
wherein the plurality of switches are manually operable
switches and the liquid crystal panel has a diagonal
dimension of at least 4 inches.

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EXHIBIT F

U.S. Patent

Dec. 31, 2002

Sheet 6 of 16

US 6,501,641 B1

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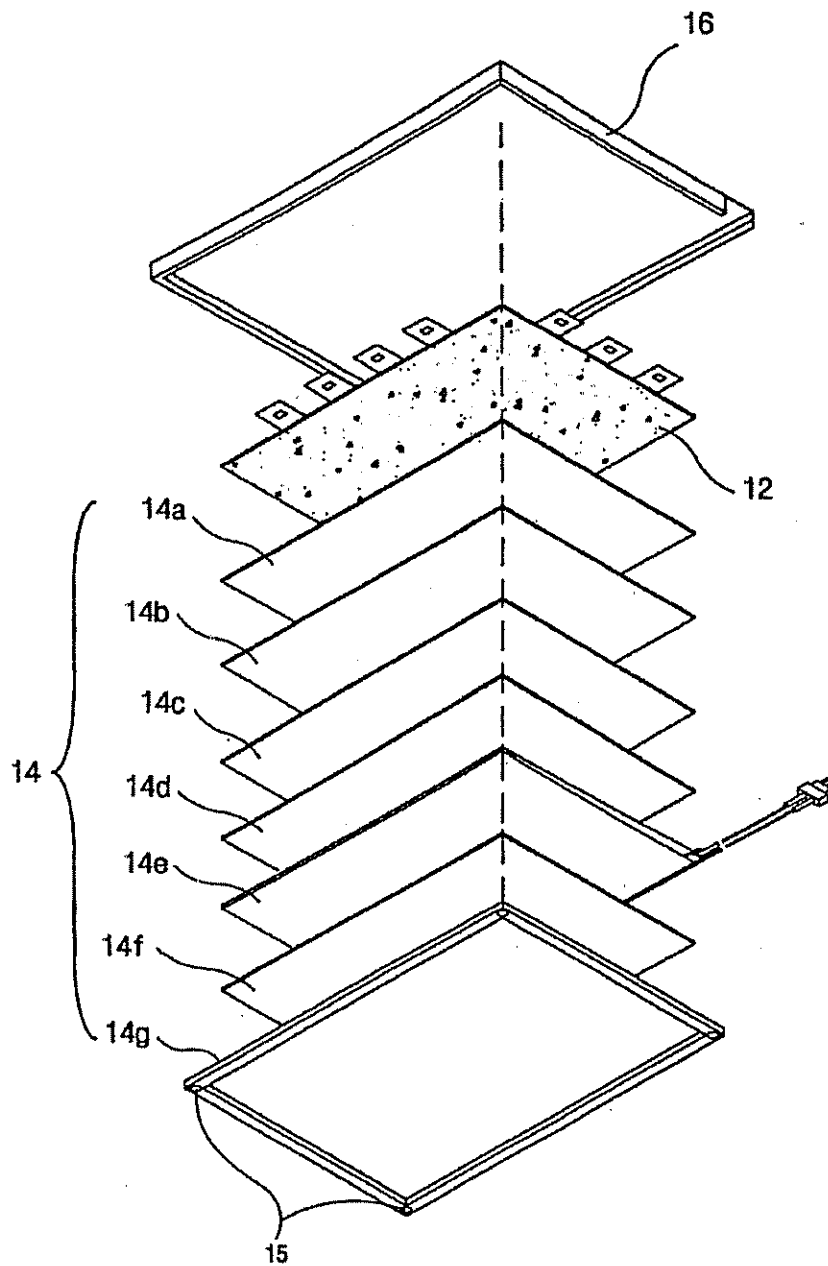


FIG. 4C

U.S. Patent

Dec. 24, 2002

Sheet 6 of 16

US 6,498,718 B1

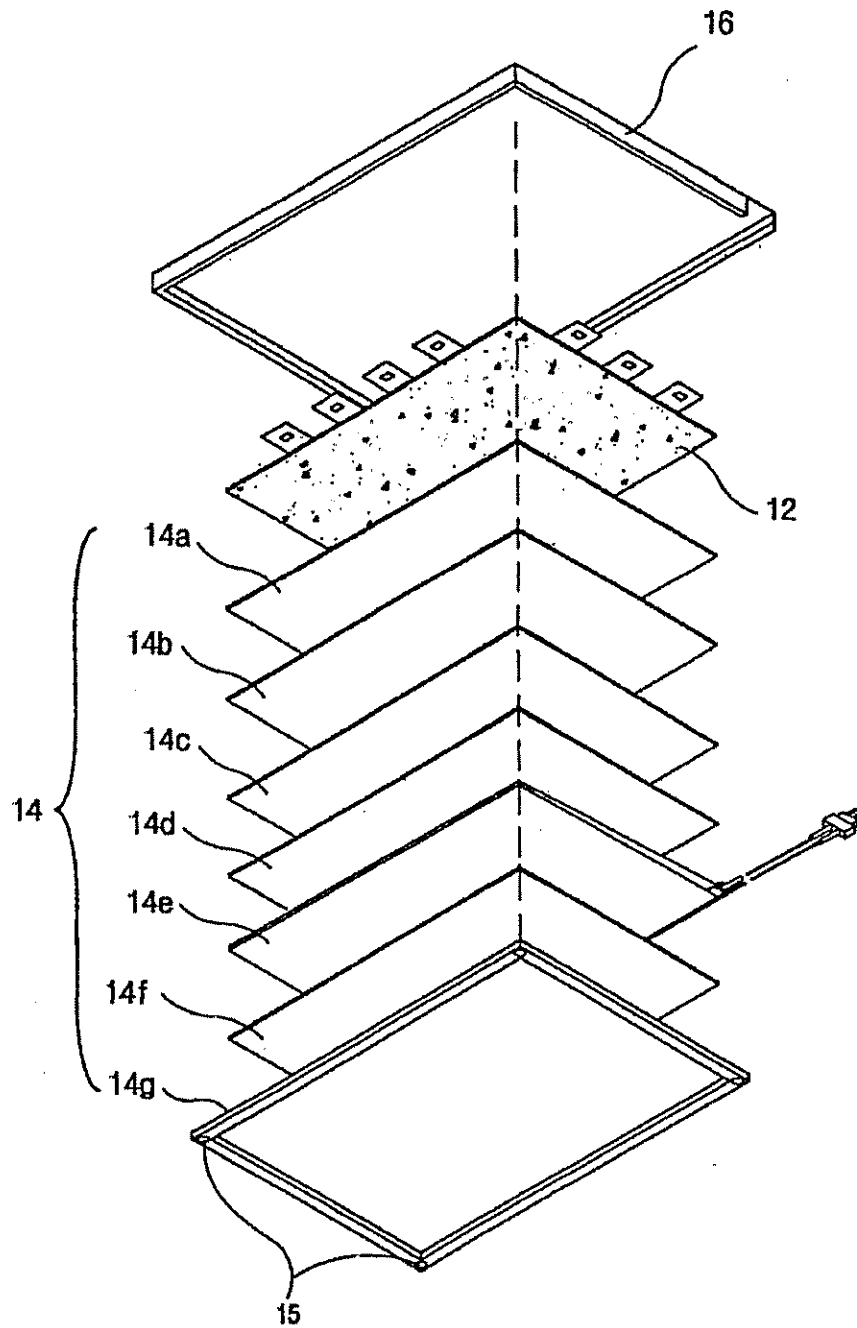


FIG. 4C